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Patent claims

1. A method for the production of a vehicle component, particularly a chassis frame (1), which is equipped with spring strut mountings (44), of an off-road vehicle, in which elongate, tubular longitudinal member hollow profiles (2, 3, 39, 40), which run parallel and are spaced apart from one another in the horizontal plane, are connected nonreleasably to one another at the respective longitudinal member end by tubular cross member hollow profiles (4, 41),
in which a hollow-profile-like crossbar (5) for receiving a rear axle, a differential and a transverse link, and a hollow-profile-like crossbar (15), which is spaced apart in the longitudinal direction and is intended for the securing of a transmission between the two end-side cross member hollow profiles (4, 41), are secured on the longitudinal member hollow profiles (2, 3, 39, 40),
in which the size and shape of the cross section of the longitudinal member hollow profiles (2, 3, 39, 40) are formed in an expanding manner by means of internal high pressure forming,
in which body mountings (6, 7, 24, 42) of the frame (1) are formed by forming secondary shaped elements laterally from the longitudinal member hollow profile (2, 3, 39, 40) by means of exertion of a fluidic internal high pressure and subsequent vertical perforation of the secondary shaped elements,
and in which bearing mountings (19, 43) of longitudinal links are likewise formed, as secondary shaped elements, laterally outward from the longitudinal member hollow profile (2, 3, 39, 40) by means of fluidic internal high pressure and are subsequently perforated.

2. The method as claimed in claim 1, characterized in that the body mounting (6, 7, 24, 42) is pinched flat in an internal high pressure forming die by closing the die with a radially protruding sheet-metal fold (25) being formed.

3. The method as claimed in either of claims 1 and 2, characterized in that the perforations of the body mountings (6, 7, 24, 42), of the bearing mountings (19, 43) of the longitudinal links and of the spring strut mountings (44) take place by means of hole punches integrated into the internal high pressure forming die in which the longitudinal member hollow profiles (2, 3, 39, 40) are formed by internal high pressure.

4. The method as claimed in one of claims 1 to 3, characterized in that the longitudinal member hollow profiles (2, 3, 39, 40) are doubled by being bent through 180° about a horizontal axis running transversely, so that the two resultant hollow profile strands (28, 29, 61, 63) come to lie on each other, with the body mountings (6, 7, 24, 42) and the bearing mountings (19, 43) of the longitudinal links being formed on the hollow profile strand (28, 61) situated on top, and the bent edges (30, 46) forming the ends of the longitudinal members of the frame (1).

5. The method as claimed in claim 4, characterized in that, before the bending in that region of the longitudinal member hollow profile (2, 3, 39, 40) which is indirectly adjacent to the bent edge (30, 46), depressions (33, 34) are introduced into the longitudinal member hollow profile (2, 3, 39, 40) mechanically by means of a punch or by internal high pressure forming thereof, into which depressions the respective cross member hollow profile (4, 41) is placed and, after the bending operation, is extensively enclosed.

6. The method as claimed in claim 4, characterized in that, before the bending in the region of the longitudinal member, in which the crossbars (5, 15) are arranged, depressions (31, 32) are introduced into the longitudinal member hollow profile (2, 3, 39, 40), into which depressions the respective crossbar (5, 15) is placed and, after the bending operation, is extensively enclosed.

7. The method as claimed in one of claims 1 to 6, characterized in that the crossbar (5, 15) is formed from an oval tube, with, first of all, the central region (67) of at least one longitudinal side (9) of the oval tube being pressed in by means of a punch until the longitudinal sides (9, 10) come to bear against each other, after which the end-side cavities (11, 12) which arise are expanded by means of internal high pressure, with the longitudinal sides (9, 10) continuing to bear against each other, to form tubes (68) which run parallel and have an approximately circular cross section and then, in the central region (67) of the longitudinal sides (9, 10), the rear axle mountings (14), the holes (16) of the securing mountings for the differential and the securing holes (8) for securing the transmission are punched out or produced by metal-cutting.

8. The method as claimed in either of claims 5 and 6, characterized in that, after the encircling of the cross member hollow profiles (4, 41) and the crossbars (5, 15) by the operation of bending the longitudinal member hollow profiles (2, 3, 39, 40) through 180° and after the securing of the resultantly formed longitudinal member hollow profile strands (28, 29, 61, 63) on one another, at least one of the latter is expanded by means of internal high pressure until a nonreleasable press fit of the cross member hollow profiles (4, 41) and of the crossbars (5, 15) in the leadthroughs formed by the depressions (31, 32, 33, 34)

of the longitudinal member hollow profiles (2, 3, 39, 40) arises.

9. The method as claimed in claim 8, characterized in that, during the expansion of the longitudinal member hollow profile strands (28, 29, 61, 63), the cross members (4, 41) and/or the crossbars (5, 15) of hollow design are acted upon from the inside with a deformation-preventing, fluidic counterpressure.

10. The method as claimed in either of claims 5 and 6, characterized in that the cross members (4, 41) and/or the crossbars (5, 15) of hollow design are expanded with a fluidic high pressure at the location of the leadthroughs formed by the depressions (31, 32, 33, 34) of the longitudinal member hollow profiles (2, 3, 39, 40).

11. The method as claimed in claim 10, characterized in that, during the expansion of the cross members (4, 41) and/or of the crossbars (5, 15), the two hollow profile strands (28, 29, 61, 63) of the longitudinal member hollow profiles (2, 3, 39, 40) are acted upon with a deformation-preventing, fluidic counterpressure.

12. The method as claimed in one of claims 1 to 11, characterized in that, in the case of a two-part design of the frame (1) with a division between the crossbars (5, 15), the mutually facing ends (18, 45, 66) of the longitudinal member hollow profiles (2, 3, 39, 40) are inserted one inside another and are subsequently connected nonreleasably to one another.

13. The method as claimed in claim 12, characterized in that the ends (18, 45, 66) which are inserted one inside another are welded to one another or, after forming at least one form-fitting element at the end (45, 66) receiving the end (18) to be inserted by means of internal high pressure with a shape-negative mating

form-fitting element being formed, are fixed in a form-fitting manner at the location of the form-fitting element.

14. The method as claimed in one of claims 1 to 13, characterized in that the spring strut mounting (44) of the frame (1) is formed from the longitudinal member hollow profile (39, 40), with the latter being bent upward by an angle of at least 90° on a section (50) at a location about a horizontal axis (52), which intersects the central longitudinal axis (51) of the hollow profile (39, 40) at an angle of approximately 45°, such that the hollow profile (39, 40) protrudes laterally there, with regard to its essentially rectilinear directional profile, outside the spring strut mounting (44), after which the lateral excess length is angled in order to form the spring strut mounting (44) after a certain height offset with respect to the hollow profile (39, 40) running outside the spring strut mounting (44).

15. The method as claimed in claim 14, characterized in that the longitudinal member hollow profile (39, 40) is formed from two separate individual hollow profiles arranged in a row next to each other, with one half of the spring strut mounting (44) being formed by the bending and angling of one end of the one individual hollow profile, and with, adjoining this one half of the spring strut mounting (44), in order to form the other half of the spring strut mounting (44), the facing end of the other individual hollow profile being bent in a mirror-inverted manner with respect to this half and being angled in the same direction, after which the two halves are connected fixedly to each other.

16. The method as claimed in claim 14, characterized in that the longitudinal member hollow profile (39, 40) is composed of in each case two separate hollow profile

strands (61) and (63) lying on each other, in that the one half of the spring strut mounting (44) is formed from an end (62) of the hollow profile strand (61) that is in the vicinity of the cross member and the other half of the spring strut mounting (44) is formed from an end (64), which tapers to this end (62), of the longer hollow profile strand (63) which runs essentially downward and is bent back on itself through 180°, in that the two ends (62, 64) are angled about an axis parallel to the longitudinal axis of that part of the longitudinal member hollow profile (39, 40) which does not belong to the spring strut mounting (44) and is situated next to it, and in that, after they are flattened at their point of abutment, the ends (62, 64) bearing against each other are connected nonreleasably, preferably welded.

17. The method as claimed in claim 14, characterized in that the spring strut mounting (44) of the frame (1) is formed as a single piece from the longitudinal member hollow profile (39, 40), with the longitudinal member hollow profile (39, 40) being bent back at both ends through 180°, and in that its ends subsequently are bent in a mirror-inverted manner with respect to one another about the horizontal axis (52), with in each case one half of the spring strut mounting (44) being formed, and are angled in the same direction, after which the halves bearing laterally against each other are connected fixedly to each other.

18. The method as claimed in claim 14, characterized in that the radially protruding section (50) is bent forward through approximately 90° - parallel to the longitudinal direction of the longitudinal member hollow profile (39, 40) - about a further parallel axis (53) spaced apart vertically from the horizontal axis (52), so that a subsection (54) of the section (50) lies approximately parallel to the longitudinal extent of the remaining longitudinal member hollow profile

(39, 40) adjoining the spring strut mounting (44), but with a height and lateral offset thereto, with the one half of the spring strut mounting (44) extending as far as the center of the subsection (54), and in that the production of the other half of the spring strut mounting (44), which half runs from the center of the subsection (54) in the direction of the front cross member (41), takes place by mirror-inverted further bending of the section (50) following the subsection (54).

19. The method as claimed in one of claims 14 to 18, characterized in that the lateral excess length is angled into a horizontal plane.

20. The method as claimed in one of claims 14 to 19, characterized in that the angled portion is flattened.

21. The method as claimed in claim 20, characterized in that the flattened portion is perforated.

22. The method as claimed in either of claims 20 and 21, characterized in that the flattened portion (65) of the ends (62, 64) is bent downward at a right angle on the end side.

23. The method as claimed in one of claims 14 to 22, characterized in that, after the bending of the longitudinal member hollow profile (39, 40) to form the spring strut mounting (44), the latter is acted upon at both ends by internal high pressure, with the cross section, which is severely crushed during the bending, of its two struts (58, 59), which produce the height offset with respect to the remaining longitudinal member hollow profile (39, 40), being expanded to form a circular cross section in rough approximation.

24. The method as claimed in one of claims 1 to 23, characterized in that form-fitting elements in the form

of depressions, preferably channels (38), are formed on the upper sides of the longitudinal member hollow profiles (39, 40) by means of a punch.

25. The method as claimed in claim 24, characterized in that mating form-fitting elements, preferably ribs (37) from the depression-free hollow profile strand, are formed in the form-fitting elements by means of internal high pressure forming after the bending to double the respective longitudinal member hollow profile (39, 40).